

CLAIMS

1. A production method of a vinyl polymer having a functional group at a molecular chain terminus
5 which comprises adding a compound (I) having a functional group and an internal alkenyl group either during polymerization or at the end point of polymerization to thereby introduce said functional group into a molecular chain terminus of the polymer in the living radical polymerization of a
10 radical-polymerizable vinyl monomer.

2. The production method according to Claim 1, wherein the functional group to be introduced into a molecular terminus is a hydroxyl, amino, epoxy, carboxyl, ester,
15 ether, amido, crosslinking silyl or terminal or internal alkenyl group.

3. The production method according to Claim 2, wherein the functional group to be introduced into a
20 molecular terminus is a hydroxyl, amino, epoxy, crosslinking silyl or terminal or internal alkenyl group.

4. The production method according to Claim 3, wherein the functional group to be introduced into a
25 molecular terminus is a terminal or internal alkenyl group.

5. The production method according to any of Claims 1 to 4,
30 wherein the compound (I) is a functional group-containing cyclic olefin.

6. The production method according to Claim 5, wherein the compound (I) is a terminal alkenyl-containing cyclic olefin or an internal alkenyl-containing cyclic olefin.

7. The production method according to Claim 6,
wherein the compound (I) is 4-vinylcyclohexene or
1,5-cyclooctadiene.

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a
8. The production method according to any of Claims 1
to 7,

wherein the living radical polymerization is carried out
in the manner of atom transfer radical polymerization.

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9. The production method according to Claim 8,
wherein a complex of copper, nickel, ruthenium or iron
is used as a metal complex catalyst.

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10. The production method according to Claim 9,
wherein a copper complex is used as the metal complex
catalyst.

11. The production method according to any of Claims 8
to 10,

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wherein an organic halide having a functional group in
addition to an initiation site or a halosulfonyl compound having
a functional group in addition to an initiation site is used
as an initiator.

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12. The production method according to any of Claims 8
to 11,

wherein an initiator having a plurality of initiation
sites is used as an initiator.

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13. A vinyl polymer
having a functional group at a molecular terminus
and being obtainable by the production method according
to any of Claims 1 to 12.

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14. The polymer according to Claim 13,

wherein the vinyl polymer is a (meth)acrylate polymer.

15. The polymer according to Claim 14,
wherein the vinyl polymer is an acrylate ester polymer.

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16. The polymer according to Claim 15,
wherein the vinyl polymer is a butyl acrylate polymer.

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17. The polymer according to any of Claims 13 to 16
which has a number average molecular weight of 500 to
100,000.

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18. The polymer according to any of Claims 13 to 17
which has a weight average molecular weight (Mw)/number
average molecular weight (Mn) ratio (Mw/Mn) of less than 1.8
as determined by gel permeation chromatography.

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19. A vinyl polymer
having a crosslinking silyl group at a molecular chain
terminus

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and being producible by reacting a vinyl polymer, which
has an alkenyl group at a molecular chain terminus and is
producible by the production method according to any of Claims
1 to 12, with a crosslinking silyl-containing hydrosilane
compound.

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20. A vinyl polymer
having a crosslinking silyl group at a molecular chain
terminus

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and being producible by reacting a vinyl polymer, which
has a hydroxyl or amino group at a molecular chain terminus and
is producible by the production method according to Claim 1,
2, 3, 8, 9, 10, 11 or 12, with a crosslinking silyl-containing
compound having a functional group capable of reacting with a
hydroxyl or amino group.

5 21. A curable composition comprising:
(A) a vinyl polymer, which has an alkenyl group at a molecular chain terminus and is producible by the production method according to any of Claims 1 to 12,
and (B) a compound having at least two hydrosilyl groups.

10 22. A curable composition comprising:
(A) a vinyl polymer, which has a hydroxyl or amino group at a molecular chain terminus and is producible by the production method according to Claim 1, 2, 3, 8, 9, 10, 11 or 12,
and (B) a compound having at least two functional groups capable of reacting with a hydroxyl or amino group.

15 23. The curable composition according to Claim 22, wherein the component (B) is a polyisocyanate.

20 24. A curable composition comprising:
a vinyl polymer, which has a crosslinking silyl group at a molecular chain terminus and is producible by the production method according to Claim 1, 2, 3, 8, 9, 10, 11 or 12.

25 25. A curable composition comprising:
(A) a vinyl polymer, which has an epoxy group at a molecular chain terminus and is producible by the production method according to Claim 1, 2, 3, 8, 9, 10, 11 or 12,
and (B) a curing agent for epoxy resins.

30 26. A production method of a vinyl polymer having a functional group at a molecular chain terminus
which comprises adding a conjugated polyene compound (II) to thereby introduce the functional group derived from the compound (II) into the polymer at a molecular chain terminus
35 in living radical polymerization of a radical-polymerizable

vinyl monomer.

27. The production method according to Claim 26,
wherein the functional group to be introduced into a
5 molecular chain terminus is a hydroxyl, amino, epoxy, carboxyl,
ester, ether, amido, crosslinking silyl or terminal or internal
alkenyl group.

28. The production method according to Claim 27,
10 wherein the functional group to be introduced into a
molecular chain terminus is a hydroxyl, amino, epoxy,
crosslinking silyl or terminal or internal alkenyl group.

29. The production method according to Claim 28,
15 wherein the functional group to be introduced into a
molecular chain terminus is a terminal or internal alkenyl
group.

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a 6²⁰
20 30. The production method according to any of Claims 26
to 29,
wherein a conjugated polyene structure in the conjugated
polyene compound (II) is a conjugated diene structure.

25 31. The production method according to Claim 30,
wherein the conjugated polyene compound (II) is isoprene,
piperylene or butadiene.

5N
a 7³⁰
30 32. The production method according to any of Claims 26
to 31,
wherein the living radical polymerization is carried out
in the manner of atom transfer radical polymerization.

33. The production method according to Claim 32,
wherein a complex of copper, nickel, ruthenium or iron
35 is used as a metal complex catalyst.

34. The production method according to Claim 33,
wherein a copper complex is used as a metal complex
catalyst.

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35. The production method according to any of Claims 32
to 34,

wherein an organic halide having a functional group in
addition to an initiation site or a halosulfonyl compound having
a functional group in addition to an initiation site is used
as an initiator.

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36. The production method according to any of Claims 32
to 35,

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wherein an initiator having a plurality of initiation
sites is used as an initiator.

37. The production method according to any of Claims 26
to 36,

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wherein the conjugated polyene compound (II) is added at
the end point of the polymerization reaction.

38. A vinyl polymer

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having a functional group at a molecular chain terminus
and being obtainable by treating a vinyl polymer, which
has the functional group at a molecular chain terminus and is
obtainable by the production method according to any of Claims
26 to 37, with an alkaline compound to thereby eliminate the
remaining terminal halogen.

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39. A vinyl polymer

having a functional group at a molecular chain terminus
and being obtainable by the production method according
to any of Claims 26 to 38.

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40. The polymer according to Claim 39,
wherein the vinyl polymer is a (meth)acrylate polymer.

5 41. The polymer according to Claim 40,
wherein the vinyl polymer is an acrylate ester polymer.

42. The polymer according to Claim 41,
wherein the vinyl polymer is a butyl acrylate polymer.

10 43. The polymer according to any of Claims 39 to 42
which has a number average molecular weight of 500 to
100,000.

SN
ag 15 44. The polymer according to any of Claims 39 to 43
which has a weight average molecular weight (Mw)/number
average molecular weight (Mn) ratio (Mw/Mn) of less than 1.8
as determined by gel permeation chromatography.

20 45. A vinyl polymer
having a crosslinking silyl group at a molecular chain
terminus and
being producible by reacting a vinyl polymer, which has
an alkenyl group at a molecular chain terminus and is producible
by the production method according to any of Claims 26 to 38,
25 with a crosslinking silyl-containing hydrosilane compound.

30 46. A vinyl polymer
having a crosslinking silyl group at a molecular chain
terminus
and being producible by reacting a vinyl polymer, which
has a hydroxyl or amino group at a molecular chain terminus and
is producible by the production method according to Claim 29,
30, 32, 33, 34, 35, 36, 37 or 38, with a crosslinking
silyl-containing compound having a functional group capable of
35 reacting with a hydroxyl or amino group.

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47. A curable composition comprising:

(A) a vinyl polymer, which has an alkenyl group at a molecular chain terminus and is producible by the method according to any of Claims 26 to 38, and (B) a compound having at least two hydrosilyl groups.

48. A curable composition comprising:

(A) a vinyl polymer, which has a hydroxyl or amino group at a molecular chain terminus and is producible by the production method according to Claim 29, 30, 32, 33, 34, 35, 36, 37 or 38,

and (B) a compound having at least two functional groups capable of reacting with a hydroxyl or amino group.

49. The curable composition according to Claim 48, wherein the component (B) is a polyisocyanate.

50. A curable composition comprising:

a vinyl polymer, which has a crosslinking silyl group at a molecular chain terminus and is producible by the production method according to Claim 29, 30, 32, 33, 34, 35, 36, 37 or 38.

51. A curable composition comprising:

(A) a vinyl polymer, which has an epoxy group at a molecular chain terminus and is producible by the production method according to Claim 29, 30, 32, 33, 34, 35, 36, 37 or 38, and (B) a curing agent for epoxy resins.